

CLAIMS

1. A liquid filter, especially an oil filter, for cleaning lubricating oil, especially for internal combustion engines in motor vehicles,

having a filter housing (2) which is arranged essentially upright in the installed state and includes a receiving area (3) for a ring-shaped filter insert (9) inserted into it for filtering a liquid,

having an inlet (19) for unclean liquid,

having an outlet (20) for cleaned liquid,

having an additional discharge channel (24) which is released by removal of the ring-shaped filter insert (9) and leads out of the receiving area (3) on a bottom (18) of the receiving area (3),

whereby a pin (25) that projects eccentrically and runs parallel to the longitudinal axis (14) is integrally molded on a lower end disk (21) of the ring-shaped filter element (9) and penetrates into an opening (26) in the discharge channel (24) and seals it when the ring-shaped filter insert (9) is inserted into the filter housing (2),

characterized in that

a ramp (28) is formed on the bottom (18) of the receiving area (3), beginning with a lower end at the opening (26) in the discharge channel (24) in the bottom (18) and rising into the interior space of the receiving area (3) with an increase in the ramp length,

the ring-shaped filter insert (9) is adapted to the filter housing (2) so that the ring-shaped filter insert (9) can rotate freely about its longitudinal axis (14) in the receiving area (3) as long as the pin (25) does not engage in the opening (26) in the discharge channel (24),

the ramp (28) and the pin (25) are coordinated with regard to positioning and interacting contact zones (29, 30) so that when the ring-shaped filter insert (9) is inserted into the filter housing (2), the pin (25) rests with its contact zone (29) on the contact zone (30) of the ramp (28) - as long as the pin has not yet penetrated into the opening (26) in the discharge channel (24) - and it slides downward with the rotation of the ring-shaped filter insert (9), penetrating into the opening (26) in the discharge channel (24) at the lower end of the ramp (28).

2. A liquid filter according to claim 1, characterized in that the ramp (28) is designed with a helical pattern.
3. A liquid filter according to claim 2, characterized in that the helical ramp (28) has an essentially complete turn, so an upper end of the ramp (28) is adjacent to the opening (26) in the discharge channel (24).
4. A liquid filter according to claim 2 or 3, characterized in that the filter housing (2) has a cover (4) which can be screwed onto the filter housing (2) to seal it,

the ramp (28) drops toward the opening (26) in the discharge channel (24) in the direction of screwing on the cover (4).

5. A liquid filter according to one of claims 1 through

- 4, characterized in that at least one guide contour (36) is formed in at least one section of the ramp (28) containing the lower end of the ramp (28) and located radially next to the contact zone (30) of the ramp (28), and this guide contour projects axially beyond the contact zone (30) of the ramp (28) toward the receiving area (3).
6. A liquid filter according to claim 5, characterized in that two radially opposite guide contours (36) are provided, with the contact zone (30) of the ramp (28) running between them.
7. A liquid filter according to one of claims 5 and 6, characterized in that the guide contours (36) have an insertion flank (42) on one end facing away from the opening (26) in the discharge channel (24).
8. A liquid filter according to one of claims 5 through 7, characterized in that several ramp sections having one or two parallel guide contours (36) are provided along the length of the ramp.
9. A liquid filter according to one of claims 1 through 8, characterized in that a projection (39) extending axially away from the pin (25) is formed on an end (38) of the pin (25) facing the ramp (28), its axially free end (40) forming the contact zone (29) of the pin (25).
10. A liquid filter according to at least claims 5 and 9, characterized in that the projection (39) is thinner in the radial direction than the radial distance between two radially opposed guide contours (36).
11. A liquid filter at least according to claims 5 and 9, characterized in that the projection (39) is longer in

the axial direction than the axial distance between the contact zone (30) of the ramp (28) and an upper end (41) of the guide contours (36).

12. A liquid filter according to one of claims 1 through 11, characterized in that the contact zone (30) of the ramp (28) is wider in the radial direction than the contact zone (29) of the pin (25).
13. A liquid filter according to one of claims 1 through 12, characterized in that the pin (25) is mounted on the lower end disk (21) in a radially flexible manner.
14. A liquid filter according to one of claims 1 through 13, characterized in that a tapering end section (43) formed on the axially free end of the pin (25) has the contact zone (29) of the pin (25).
15. A liquid filter according to one of claims 1 through 14, characterized in that the contact zone (29) of the pin (25) is designed as a spot or a line.
16. A liquid filter according to one of claims 1 through 15, characterized in that the pin (25) has a rounded or inclined flank (45) on its axially free end on the side which leads when the pin (25) slides along the ramp (28).
17. A liquid filter according to one of claims 1 through 16, characterized in that the pin (25) is mounted so it is axially adjustable on the lower end disk (21) and/or the ring-shaped filter insert (9) is axially adjustable on the cover (4).
18. A liquid filter according to claim 17, characterized in that spring means (47, 48) are provided which apply tension to the pin (25) and/or the ring-shaped filter

insert (9) in the direction of the ramp (28).

19. A liquid filter according to one of claims 1 through 18, characterized in that the filter housing (2) can be sealed with a screw-on cover (4),

retaining means (5, 7, 8, 15) are provided with which the ring-shaped filter insert (9) can be mounted on the cover (4) so it can rotate about its longitudinal axis (14) and is secured axially,

the retaining means have catch hooks (7) which extend essentially axially and have a radial flexibility,

the retaining means have a radially projecting ring-shaped shoulder (15) on which the catch hooks (7) engage when the ring-shaped filter insert (9) is placed on the cover (4),

an upper end disk (17) has a central orifice on whose edge are arranged a gasket (16) and a ring-shaped collar (13),

a central ring (6) mounted on the cover (4) is arranged coaxially with the ring-shaped collar (13) when the ring-shaped filter insert (9) is placed on the cover (4), and the gasket (16) forms a seal radially between the ring (6) and the ring-shaped collar (13).

20. A liquid filter according to claim 19, characterized in that the elements of the retaining means arranged on the ring-shaped filter insert (9) are designed axially and radially in the interior space (11) of the ring-shaped filter insert (9).

21. A liquid filter according to claim 19 or 20,

characterized in that the elements of the retaining means arranged on the ring-shaped filter insert (9) are designed on an inner frame (12) of the ring-shaped filter insert (9).

22. A liquid filter according to claim 21, characterized in that the elements of the retaining means arranged on the ring-shaped filter insert (9) are manufactured in one piece with the inner frame (12).
23. A liquid filter according to claim 19 or 20, characterized in that the elements of the retaining means arranged on the ring-shaped filter insert (9) are formed on the upper end disk (17) of the ring-shaped filter insert (9).
24. A liquid filter according to claim 23, characterized in that the elements of the retaining means arranged on the ring-shaped filter insert (9) are manufactured in one piece with the upper end disk (17).
25. A ring-shaped filter insert for a liquid filter according to one of the preceding claims.